TROUBLESHOOTING

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600, 600D, 610, 611 Loader
Service Manual

2–1 TROUBLESHOOTING THE DRIVE SYSTEM

PROBLEM	CAUSE	CORRECTION	Ref.
Clutch will not drive or engage correctly.	Clutch shafts out of adjustment.	Make clutch adjustment.	
	Using wrong oil.	Put in correct oil.	
	Actuated thread hitting sidewall.	Correct clutch adjustment.	
	Bearings are not correctly located in clutch plate hubs.	Bearings should be even with each end of hub.	
	Large hex nut hangs up on side cover.	Change position of nut.	
	Clutches over tightened, no neutral on control levers.	Correct clutch adjustment.	
	Force needed to release clutches. No full thread contact between actuating threads and actuating nuts. Threads and nuts are worn unevenly.	Install new actuating threads and nuts.	
Early clutch thrust bearings failure.	Rough races on clutch plates.	Install new bearings and races on both clutches.	
	Operator putting more force than necessary on levers.	Use less force on levers.	
	Wrong amount of counterweight.	Use correct counterweight.	SEE SECTION 3
	Alignment nut not making correct alignment.	Free alignment nut.	
Early clutch lining failure and wear.	Rough clutch faces.	Install clutch face and lining.	
	Clutch adjustment not correct.	Install clutch lining and make clutch adjustment.	
	Clutch lubrication tubelines have restriction.	Inspect tubelines for restriction.	
	Clutch lining has been forced on shoulder of inside clutch plate.	Install clutch lining and check so it fits loosely on shoulder of inside clutch plate.	
More than normal primary drive chain wear.	Upper jackshaft sprocket not in alignment with outer clutch sprocket.	Make adjustment for correct alignment.	
	Chain is over tightened.	Make chain adjustment.	
Oil leakage of upper jackshaft bearings.	Bearing in backward.	Install bearing correctly.	
	Bad shaft.	Inspect shaft and install new shaft.	
	Bad seal in bearing.	Install new bearing and seal.	
	Bad gasket for bearing housing.	Tighten housing holding bolts.	
		Install new gasket.	
Oil leakage by clutch shaft caps.	Cap loose.	Tighten cap.	
	O–ring seal installed wrong.	Install new O–ring seal.	
	Bad O–ring seal.		

2–1 TROUBLESHOOTING THE DRIVE SYSTEM (Cont'd)

PROBLEM	CAUSE	CORRECTION	Ref.
Roto–Swivel Leak.	O–ring or seal worn.	Install new O–ring or seal.	
	Pressure higher than necessary.	Make pressure adjustment.	
Variable speed belt moves higher than required, then goes below its required position.	Worn O–rings in push rod of variable speed valve.	Install new O–rings.	
	Leaking O–rings in variable speed drive.	Make pressure adjustment.	
	Stationary half sheave rough inside.	Install new O–rings.	
		Smooth and install seal kit.	
Increase in direction control lever movement in one direction.	Clutch thrust bearing.	Install new bearing.	
	Threads are bad on actuator nut.	Install new actuator nut.	
	Splines are worn on direction control lever or linkage shaft.	Install new lever and shaft.	
Direction control lever side play.	Bolt is missing from direction control lever.	Install bolt.	
	Splines are worn on direction control lever or linkage shaft.	Tighten the bolt.	SEE SECTION 3
	Holding nut is worn.	Install new nut.	
Loud noise in drive system.	Direction control lever linkage is loose on lever.	Tighten the bolt.	
	Spring washers are not in place on actuating bar.	Put spring washers in correct place.	
	Actuating bar is bent.	Straighten bar or install new bar.	
	Actuating nut hits bottom against side wall.	Correct clutch adjustments.	
	Primary chain is over tightened.	Loosen and make adjustment.	
	Chain is out of alignment.	Make correct alignment.	
	Upper jackshaft bearings are bad.	Install new bearings.	
	Secondary chain is out of adjustment.	Make correct adjustments.	
	Lower jackshaft sprocket is loose.	Tighten sprocket.	
Side panel is difficult to install.	Self–alignment nut is not turned correctly.	Turn self–alignment nut so a flat is on top.	
	Secondary drive chain is over tightened.	Correct adjustment on chain.	
	Primary drive chain is over tightened.	Correct adjustment on chain.	

PROBLEM	CAUSE	CORRECTION	Ref.
Lubricant fitting on variable speed driven sheave is breaking off.	Spring hits the fitting under compression.	Turn spring so it will clear fitting.	
Loss of power with drive belt.	Belt hits bottom on drive sheave.	Move lever forward to move belt outward when placing variable speed in low position.	
	Spring load jackshaft sheave not in adjustment.	Make sheave adjustment.	
	Grease on faces of drive and driven sheaves.	Clean sheaves.	
	Belt is worn.	Install new belt.	
Breaking of drive belt.	Alignment of driven sheave.	Make correct alignment.	
	Spring loaded sheave adjustment too tight.	Make adjustment of sheave.	
	Moving half of driven sheave not sliding free of shaft.	Clean sheave and shaft and lubricate.	
	Three sliding bolts are bearings on driven sheave are worn.	Install new parts.	
	Engine has come loose causing alignment to be off.	Correct alignment and inspect for wear.	SEE SECTION 3
	Bore of fixed half of driven sheave is worn.	Install sheave and jackshaft.	
	Too high lift pressure.	Correct pressure.	
Chains are tight and there is free play in wheels.	Sprocket holding nuts are loose.	Tighten and lock the nuts.	
	Worn axle splines or multiple sprockets.	Install new axle or sprockets.	
Breaking of axle sprocket.	Using wrong sprockets.	Install correct sprockets.	
	Using wrong type chain.	Install correct chain.	
	Using wrong type chain connector.	Install correct chain connector.	
	Chain hitting other parts.	Inspect chain for clearance and correct.	
	Out of round sprocket.	Install new sprocket.	
	Bushing missing on axle to hold sprocket in place.	Install bushing.	
Breaking of axle.	Filling bucket with front wheels off the ground.	Keep all four wheels on ground.	
	Wrong type chain.	Install correct chain.	
	Wrong type chain connector.	Install correct chain connector.	
	Wrong balanced weight.	Use correct balanced weight.	
	Using solid tires.	Reduce speed with solid tires.	

PROBLEM	CAUSE	CORRECTION	Ref.
Breaking drive chains.	Chains are not tight enough.	Tighten chains.	
	Worn chains and sprocket.	Install new chain and sprocket.	
	Using wrong axle sprockets.	Install correct sprockets.	SEE SECTION 3
	Operating with different diameter tires on same side of loader.	Install tires with same diameter.	
	Using solid type tires.	Install air filled tires.	
	Loose items in tank.	Remove.	
	Using wrong chain.	Install correct chain.	
	Using more counterweight than is needed.	Use correct amount of counterweight.	

PROBLEM	CAUSE	CORRECTION	Ref.
Hydraulic system failure.	Oil level.	Check hydraulic oil level and fill to top check plug.	
	The hydraulic pump is not moving.	Check pump coupling.	
	Master release valve is held open.	Clean master release valve.	
	Clutch manifold release valve is held open.	Remove valve and clean it.	
Rough hydraulic movement.	Air in hydraulic system.	Vent air from tubelines and cylinders by pushing cylinders as far as they will go in both directions, push pedal for about 10 seconds each way.	
	A leak between reservoir and hydraulic pump causes air to enter the pump.	Check all fittings and fasteners for tightness. Check that fittings on back of the vacuum gauge (hydraulic oil filter condition indicator) on right instrument panel are tight.	
	Foreign material in clutch manifold release valve holds valve open so air is pulled into the hydraulic pump through the clutch shafts.	Remove the valve and clean it.	SEE SECTION 4
	Dirty hydraulic oil filter is causing low flow and high vacuum.	Change the hydraulic oil filter whenever the indicator needle on the gauge is in red zone.	
	The large nut on end of filter container is not tightened.	Tighten large nut to only 12 foot pounds (1.7 m/kgf).	
	Air is entering the hydraulic pump beyond the shaft seal.	Install a new seal	
Lift arm raises slowly at full engine RPM.	Lifting more than loaders rated capacity.	Operate loader within rated capacity.	
	There is an oil leak beyond piston seals in one or both lift cylinders.	Check the piston seals.	
	Lift control linkage is out of adjustment.	Make adjustment of linkage.	
	Leaking spool inside lift cylinder.	When spool is not centered in the valve with the pedal in neutral position, make linkage adjustment.	
		When spool or valve housing is broken or marked, replace the valve.	
	Hydraulic pump is worn and not delivering its rated volume of oil.	Check condition of the pump and repair or install new pump.	
	Fluid may have been used to fill the hydraulic system of a new attachment.	Add hydraulic oil to reservoir.	

PROBLEM	CAUSE	CORRECTION	Ref.
Lift arms drift with bucket empty.	Dirty check valve at the left control valve section.	Clean, check valve.	
	Lift control linkage is out of adjustment.	Make adjustments of control linkage so spool centers correctly in the valve in neutral position.	
Rough control valve movement.	The control pedals are rough because of no lubrication.	Lubricate and clean away old grease.	
	The spool centering spring inside the valve is broken.	Install new spring.	
	The control valve housing is out of line because of wrong fastening.	Fasten valve group with only the three outside bolts, putting shims under the valve on the bolts to fasten it away from plate.	
Loose of hydraulic fluid in hydraulic system, (external).	Oil may be leaking beyond any of these seals or gaskets: 1. Clutch shaft caps. 2. Gearcase side panels. 3. Axle. 4. Upper jackshaft. 5. Lower jackshaft fastenings. 6. Control lever pivots. 7. Clutch shafts fasteners.	Check all bolts and nuts for looseness. Make repairs when there is leakage beyond seals or gaskets. Fill oil in reservoir to make up for lost oil. Check all seals and replace any allowing oil loss.	SEE SECTION 4
	Oil has been used to fill the hydraulic system of a new attachment.	Add new hydraulic oil.	
	Oil leak through hole on welded tank joint.	Check for leaks in the frame tanks and weld.	
	Oil is leaking beyond the lift or tilt cylinder shaft seals.	Install shaft seals and inspect the cylinder shafts for damage. Add new oil.	
	Loose hydraulic connections in the hydraulic systems.	Tighten the connections or install them when they don't seal. Add new oil.	
	Oil is leaking through holes at the cylinder openings.	Remove the cylinder and weld holes. Add new oil.	
	Oil is leaking beyond the variable speed drive swivel seals.	Install seals. Add new oil.	
Hydraulic cylinder leaks (internal).	Case is damaged, causing piston to wear flat and seal to leak oil.	Install new cylinder.	
	Case is rough beyond the piston at that point.	Install new cylinder case and piston seals.	

PROBLEM	CAUSE	CORRECTION	Ref.
Hydraulic cylinder leaks (external).	The shaft is rough, causing oil loss along the shaft and bad seal.	Smooth shaft. Install shaft seals. Add new oil.	
	There is oil line or fitting leak.	Tighten or install new fitting. Add new oil.	
	Hole in weld on fitting.	Remove, clean the cylinder. Weld around fitting. Add new oil.	
	Cylinder head leaks.	Install O–ring. Add new oil.	
	Hole in cylinder housing.	Remove the cylinder and weld. Add new oil.	
	Seals are bad.	Smooth rod and install seal.	
Hydraulic control valve leaks (external).	The valve body is broken.	Install the valve. Add new oil.	
	There is a hole in the valve housing.	Install new valve. Add new oil.	
Hydraulic control valve leaks (internal).	The control linkage is out of adjustment.	Make adjustment of linkage so the spool is centered in the valve housing with the control pedal in neutral position.	SEE SECTION 4
	The valve spool is marked.	Install new valve.	
	The valve body is marked.	Install new valve.	
Lift arm does not drift down, but drops when raised slowly.	The load check valve will not seat correctly.	Clean and install any parts needed.	
	Running the variable speed at a constant high variable speed position, holding pressure buildup in the cylinder can cause seal failure.	Do not run continuously at one variable speed position.	
The variable speed cylinder will not hold in high speed position (on models equipped with variable speed control valve with holding pressure release).	The plunger in the holding release valve part of the control valve is too long. It will not allow the check ball to seat.	Put shims behind the cast spring holding bracket. Install .020" thick shims on fastening bolts. Make adjustment for release pressure of 600 PSI.	
	Worn O–rings in the plunger.	Install new O–rings.	
No change when the variable speed control lever is put in low speed position (on loaders with a check valve).	There is a high holding pressure buildup in the variable speed cylinder.	Let the loader cool.	
		Loosen the hydraulic hose fitting at the check valve to release some of the pressure.	
		Replace the variable speed control valve with one having a pressure release valve.	

PROBLEM	CAUSE	CORRECTION	Ref.
Tilt control valve body split.	Casting stress due to changing shape of fastening plate.	Fasten valve group with only the three outside bolts, laying shims under the valve on the bolts to fasten it away from the plate.	
		Install new valve.	
	The release valve pressure is too high in lift and auxiliary valve.	Lower the release setting to 1800 to 1900 PSI.	
The bucket will not hold tilted back with the control in neutral position.	Oil leaks between the valve spool and the valve housing with the spool centered.	Spool is worn or seals are bad.	
The lift arms drift down from raised position with the lift control pedal in neutral position.	There is an external oil leak between the lift control valve and cylinders.	Check for external leaks and correct.	
	The spool is not centering in the valve housing when the control pedal is released.	Make adjustment of control linkage so the spool will center with the pedal in neutral position.	
		Check for a bad spool or rough action.	SEE SECTION 4
		Check for a broken spool center spring in the valve.	
	Oil leaks between the valve spool and the valve housing with the spool centering.	Install new valve. Check condition of the cylinder seals before installing the valve.	
	The lift cylinder seals are leaking under a load.	Install new seals.	
The hydraulic oil filter condition indicator shows no reading at full engine RPM.	There is a hole in the filter element.	Install new filter element.	
	The cork and steel gaskets have not been installed on the ends of filter element during service.	Install new cork and steel gaskets.	
	The release valve in the filter container is holding open.	Check the release valve and clean it.	
	There is a leak in the vacuum line (between the filter and gauge).	Check all conditions for tightness.	
	The vacuum line (between the filter and gauge) is closed.	Open the line.	
	The hydraulic oil filter container has not been tightened.	Tighten the large nut on the end of the filter container to 12 ft.–lbs. (1.7 m/kgf).	
	The condition indicator gauge is bad.	Install new gauge.	

PROBLEM	CAUSE	CORRECTION	Ref.
More than normal hydraulic pump wear (600 gasoline or LP gas models).	There is not enough clearance between the pump drive adapter halves, over maximum thrust on the pump drive shaft.	Make adjustment of adapter to hold .015 to .030 inches clearance between the adapter halves. Rotate to check for even clearance.	
	Dirty hydraulic oil.	Empty reservoirs and fill with clean oil.	
	Pump drive out of alignment.	Make correct alignment.	
Noise in hydraulic pump.	Oil supply is low (hydraulic oil).	Fill the reservoir to the upper check opening.	
	Wrong grade oil.	Change to correct oil.	
	The oil filter is dirty.	Change the oil filter.	
	The suction tubeline (between the reservoir and pump) is stopped.	Remove and clean the suction tubeline.	
	There is an air leak between the reservoir and pump.	Inspect for and correct any air leaks.	SEE SECTION 4
	Worn pump coupling.	Install new coupling.	
The hydraulic oil is heating.	Oil supply is low (hydraulic oil).	Fill the reservoir to the upper check opening.	
	The oil is dirty.	Empty the reservoir and fill with clean oil.	
	The master release valve setting is low.	Check the pressure and set to proper release setting (1700 ± 25 psi), 119.5 ± 1.8 kgf/cm2).	
	Lift & auxiliary relief valve set low.	Set to 1800 $^{+100}_{-0}$ psi (126.5 $^{+7}_{-0}$ kgf/cm2).	
	Wrong grade oil.	Empty the reservoir and change to correct weight oil.	
	Worn hydraulic pump.	Repair or install new pump.	
Hydraulic pump seal leaks.	Worn shaft seal.	Install new shaft seal.	
	Broken body seal or gasket.	Install new seal or gasket.	
	The bearings are out of position.	Install new bearings.	
	There is internal wear.	Install new parts.	
Air in hydraulic oil.	The oil supply is low.	Fill the reservoir to the upper check openings.	
	Air is leaking into the suction side of pump.	Inspect all fittings and fasteners and tighten.	
		Inspect to be sure the fittings on back of the vacuum gauge (hydraulic oil filter condition indicator) on the right dash panel are tight.	

PROBLEM	CAUSE	CORRECTION	Ref.
Air in hydraulic oil. (Cont'd)	Air is leaking into the cushion side of pump. (Cont'd)	Inspect to be sure all connections at the hydraulic oil filter are tight.	
		Check for air leaking into the hydraulic pump beyond the shaft seals and install the seals when leaking.	
		Check clutch manifold release valve for foreign material holding check valve open.	SEE SECTION 4
	Using wrong oil.	Empty release and fill to upper check opening with correct oil.	
Large amount of hydraulic pump coupling wear.	Alignment between engine and pump not correct.	Correct alignment.	
Auxiliary or lift control pedals will not hold in over the center position.	Wrong adjustment of control linkage.	Make correct adjustment of control linkage.	
Hydraulic pressure gauge indicates less than 1650 (116 kgf/cm2) with pressure control valve open.	Master release valve setting is low.	Make adjustment of master release valve.	
	Master release valve is dirty.	Clean valve.	
	Hydraulic pump worn.	Install new pump.	
	Cartridge release setting in left and auxiliary control valve is low.	Make correct adjustment.	

2–3 TROUBLESHOOTING THE ENGINE

CODE	ENGINE TYPE
	D–Diesel, A–All, G–Gas

PROBLEM	CODE	CAUSE	CORRECTION	Ref. (Section)
Engine will not turn over.	A	Bad fuse in the wiring.	Install new fuse.	5, 6, 7
	A	Loose battery connection.	Clean battery terminals and connect cables, tightening them.	5, 6, 7
	A	Battery is discharged.	Charge battery. Check charging system.	5, 6, 7
	A	Bad starter switch.	Install new switch.	5, 6, 7
	A	Loose starter connections.	Tighten connections.	5, 6, 7
	A	Broken or disconnected wiring harness.	Connect or repair wiring harness.	5, 6, 7
Engine fails to start or is difficult to start.	A	The variable speed is in high speed.	Pull variable speed drive control lever all the way back before stopping engine.	5, 6, 7
	A	The clutches are engaged with steering levers in neutral position. The loader will move while starting.	Make adjustment of clutches so levers will travel 3 to 4 inches from neutral position, in each direction.	5, 6, 7
	A	Starting procedure is not correct.	Refer to "Starting Procedure" in Bobcat Operation section of this manual.	5, 6, 7
	A	No fuel in tank.	Put in fuel.	5, 6, 7
	A	The engine air cleaner is dirty.	Service air cleaner.	5, 6, 7
	A	The air vent hole in fuel tank cap is plugged.	Remove and clean cap.	5, 6, 7
	A	Fuel line leaks.	Repair line.	5, 6, 7
	A	Damaged fuel pump.	Repair or install new pump.	5, 6, 7
	G	The carburetor is not being choked enough.	Choke as required.	5
	G	The carburetor is being choked too much when starting a warm engine.	Correct choking procedures.	5
	A	Water, dirt or foreign material in fuel.	Drain and clean fuel system. Fill with clean fuel.	5, 6, 7
	G	Dirty carburetor.	Clean carburetor.	5
	G	The ignition cable is disconnected from magneto, distributor or spark plugs.	Connect ignition cable.	5
	G	Broken ignition cables, cause short circuits.	Repair or install new cables.	5

PROBLEM	CODE	CAUSE	CORRECTION	Ref. (Section)
Engine fail to start or is difficult to start (Cont'd)	G	The ignition cables, distributor or spark plugs are wet.	Dry and clean them.	5
	G	Moisture in ignition system due to fertilizer dust settling into or around switches, fuses, ignition wire, battery terminals or distributor cap.	Store idle loader in a dry place as far as possible from stored fertilizer.	5
			Clean fertilizer dust off loader daily and wash it off frequently with diesel fuel.	5
			Spray ignition system with a sealant made to prevent moisture problems.	5
	G	The spark plugs are wet or dirty.	Clean or install new spark plugs.	1
	G	the spark plug gaps are wrong.	Gap or install new.	1
Engine fails to start or is difficult to start.	G	The ignition is out of time.	Correct timing.	1
	G	Bad condenser or coil.	Install new.	5
	G	Bad distributor.	Repair or install new.	5
	A	Wrong crankcase oil (cold weather).	Use an engine oil of proper viscosity.	5, 6, 7
	A	The valves are leaking or sticking.	Clean and reseat the valves.	5, 6, 7
	A	Valve tappets out of adjustment.	Make adjustment.	5, 6, 7
	A	Cylinders dry due to engine having been out of use for some time.	Correct compression by pouring a small amount of engine oil into cylinders.	5, 6, 7
	G	Loose spark plugs.	Install new gaskets and tighten.	1
	A	Damaged cylinder head gasket or loose cylinder head.	Install new gasket and tighten.	5, 6, 7
	A	Piston rings stuck in piston.	Clean the parts and install new rings.	5, 6, 7
	A	Damaged cylinders (lack of compression).	Repair.	5, 6, 7
	D	Air in the fuel system.	Bleed the system.	6, 7
	A	Fuel filter is plugged.	Install a new element.	5, 6, 7
	D	Faulty injector nozzle.	Check, clean and make adjustment.	6, 7
	D	Faulty injector pump.	Make adjustment or install new pump.	6, 7
Engine runs rough. Power is low. Engine may stop.	D	Wrong decompressor setting.	Make adjustment.	6, 7
	D	Air in fuel lines.	Bleed the system.	6, 7
	A	Water in the fuel system.	Empty fuel system. Fill with clean fuel.	5, 6, 7

PROBLEM	CODE	CAUSE	CORRECTION	Ref. (Section)
Engine runs rough. Power is low. Engine may stop.	D	Air in fuel system.	Check for and correct leaks.	6, 7
	D	Bad injector nozzle.	Check, clean and make adjustment.	6, 7
	A	Fuel filter is plugged.	Install a new element.	5, 6, 7
	A	Wrong valve clearance.	Make valve adjustment.	5, 6, 7
	A	Broken valve spring.	Install a new spring.	5, 6, 7
	G	Spark plug gap not correct.	Correct spark plug gaps.	1
	D	Wrong decompressor setting.	Make adjustment.	6, 7
	G	Wrong type spark plugs.	Check recommendations.	1
	G	Wrong ignition timing.	Correct timing.	1
	G	Bad spark plugs.	Clean or install new. Check cause.	1
	G	Bad breaker points.	Check for cause and install new.	1
	G	Loose ignition cables or worn or broken cables.	Repair or tighten or install new.	5
	A	Poor compression.	Tighten cylinder heads and check gaskets.	5, 6, 7
Engine fails to start or is difficult to start.	G	Incorrect fuel mixture.	Make carburetor adjustment.	5
	G	Dirty carburetor.	Clean.	5
	A	Fuel screen fuel of foreign material.	Clean.	5, 6, 7
	G	Carburetor flooding.	Check carburetor adjustment.	5
	A	Governor out of adjustment.	Correct adjustment.	5, 6, 7
	A	Sticking valves.	Free the valves.	5, 6, 7
	A	Pitted valves.	Grind or install new.	5, 6, 7
	A	Dirty engine (may be due to blocked exhaust.	Clean and clear.	5, 6, 7
	A	Wrong fuel.	Drain the fuel system and fill with clean correct fuel.	5, 6, 7
	A	Dirty Air cleaner.	Service the air cleaner.	5, 6, 7
	D	Incorrect fuel timing.	Make adjustment.	6, 7
	A	Broken compression ring.	Check. Install new.	5, 6, 7
	D	Excessive carbon on pistons and cylinder head.	Clean the carbon from the cylinder head and pistons.	6, 7
	A	Worn cylinder and pistons.	Recondition the engine.	5, 6, 7

2–3 TROUBLESHOOTING THE ENGINE (Cont'd)

PROBLEM	CODE	CAUSE	CORRECTION	Ref. (Section)
Engine overheats.	A	Engine is overloaded.	Operate at a lower variable speed set. Operate at a 3/4 to full throttle setting.	See Owner's Manual
	A	Engine cooling fins are dirty.	Clean the cooling fins.	1
	A	Engine has been operated with part of the housing removed.	Clean the cooling fins and install housing.	1
	A	Dirty engine oil.	Change engine oil.	1
	D	Blower not operating.	Check drive.	6, 7
	A	using wrong grade of engine oil.	Change to proper oil grade and viscosity oil.	1
	A	The crankcase oil level is low.	Add oil.	1
	A	Excessive valve clearance.	Make adjustment.	5, 6, 7
	D	Restriction in exhaust.	Remove restriction.	6, 7
	A	Engine is not being lubricated properly.	Check operation of engine oil pump.	5, 6, 7
	D	Carbon in engine.	Clean the carbon from cylinder heads and pistons.	6, 7
	D	Faulty injector nozzles.	Check, clean and make adjustment.	6, 7
	D	Faulty injector pump.	Make adjustment or install new.	6, 7
	A	Worn pistons.	Install new pistons.	5, 6, 7
	A	Worn connecting rod bearings.	Install new bearings.	5, 6, 7
	D	Loose flywheel.	Tighten or install when bore is damaged.	6, 7
Engine making hitting noise.	A	Worn main bearings.	Install new main bearings. Check proper lubrication bearings.	5, 6, 7
	A	Carbon on the pistons.	Clean the carbon from top of pistons and from cylinder heads.	5, 6, 7
	D	Fuel timing is wring.	Make adjustment of timing.	6, 7
	A	Broken piston ring.	Install a new ring or rings.	5, 6, 7
	G	Poor grade of gasoline.	Use good grade gasoline.	1
	A	Engine operated under heavy load at low speed.	Always operate at 3/4 to full throttle setting.	–
	A	Low oil supply.	Add oil.	1
	A	Dirty oil.	Change oil.	1
	G	Incorrect timing.	Making timing adjustment.	1
	G	Wrong spark plugs.	Install correct spark plug.	1
	A	Worn or loose piston pin.	Install new.	5, 6, 7
	A	Worn main bearings.	Install new.	5, 6, 7
	A	Excessive camshaft end clearance.	Make adjustment.	5, 6, 7

PROBLEM	CODE	CAUSE	CORRECTION	Ref. (Section)
Engine will not stop.	G	Improper carburetor idling adjustment.	Make carburetor adjustment.	5
	G	Carburetor jets dirty.	Clean.	5
	G	Spark plug gap is small.	Make adjustment of gap.	1
	G	Leaking carburetor or manifold gaskets.	Tighten or install new gaskets.	5
	G	Dirty or leaking valves.	Clean and reseat valves.	5
	G	Weak coil or condenser.	Install new.	5
Oil consumption. (Light blue exhaust smoke.)	A	Oil is light.	Empty, refill with correct oil.	1
	A	Crankcase pressure.	Clean vent valve.	1
	A	Worn piston rings.	Install new.	5, 6, 7
	A	Crankcase overfilled.	Clean vent valve.	1
Black exhaust smoke. Excessive fuel used. Spark plugs dirty.	G	Fuel mixture.	Make adjustment of carburetor or choke.	5
	G	Choke not open.	Inspect linkage and setting.	5
	G	Dirty air cleaner.	Service the air cleaner.	1
	G	Crankcase pressure.	Clean vent valve.	1
Low oil pressure.	A	Bad indicator.	Install new indicator.	5, 6, 7
	A	Oil is light.	Empty. Fill with correct oil.	1
	A	Oil level low.	Add oil.	1
	A	Dirt on oil screen.	Clean.	5, 6, 7
	A	Badly worn oil pump.	Repair.	5, 6, 7
	A	Incorrect oil pressure setting.	Make adjustment.	5, 6, 7
	G	Leaking fuel pump.	Install new fuel pump.	5
High oil pressure.	A	Bad indicator.	Install new indicator.	5, 6, 7
	A	Oil grade is heavy.	Empty. Refill with correct oil.	1
	A	Oil lines dirty.	Clean all lines and openings.	5, 6, 7
	A	Oil relief valve stuck.	Clean by–pass. Install when needed.	5, 6, 7

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